

TAKE THE RIBBON CABLE SUPPLIED AND STRIP BACK THE INSULATION ABOUT $\frac{1}{4}$ INCH ON EACH END OF EACH WIRE. TURN YOUR NEW DOUBLE H ZX KEYBOARD OVER AND YOU WILL SEE WHERE THE SHORT CABLE AND CONNECTOR IS SOLDERED. ONE END IS MARKED WITH A "1" AND THE OTHER END IS MARKED "18". BEGIN SOLDERING THE CABLE TO THE KEYBOARD AT THE NUMBERS INDICATED IN TABLE 1 AND THEN TO YOUR COMPUTER.

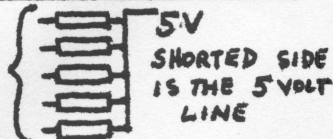
TABLE 1

KEYBOARD	ZX81	MICROACE	ZX80
1	KBD0	R20	R17
4	KBD1	R22	R16
5	KBD2	R19	R13
6	KBD3	R21	R14
7	KBD4	R18	R15

ON THE ZX81 SOLDER THE RIBBON CABLE TO THE 5 PIN KEYBOARD CONNECTOR, STARTING WITH THE PIN CLOSEST TO THE 8 PIN CONNECTOR AS "KBD0".

ON THE ZX80 AND MICROACE, CONNECT TO THE SIDE OF THE RESISTORS NOT CONNECTED TO THE 5 VOLT LINE. WITH AN OHMMETER AND THE POWER OFF, CHECK THE RESISTORS TO FIND WHICH END IS SHORTED TO THE OTHER RESISTORS. THIS IS THE 5 VOLT LINE AND YOU SHOULD CONNECT TO THE OTHER END OF EACH RESISTOR IN TABLE 1.

CONNECT
TO THIS
END OF
EACH
RESISTOR



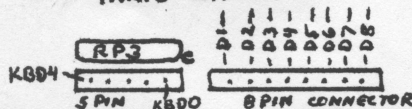
CONTINUE SOLDERING THE REST OF THE CABLE TO THE KEYBOARD AND TO THE DIODES INDICATED IN TABLE 2.

KEYBOARD	ZX81	MICROACE	ZX80
9	D6	D1	D3
10	D4	D2	D4
11	D2	D3	D5
12	D1	D4	D6
13	D3	D5	D7
14	D5	D6	D8
15	D7	D7	D9
16	D8	D8	D10

ON THE ZX81 D1 IS THE DIODE CLOSEST TO THE 5 PIN CONNECTOR, AND THEY ARE IN ORDER THROUGH D8. CONNECT TO THE END THAT IS CONNECTED TO THE 8 PIN KEYBOARD CONNECTOR.

ON THE MICROACE AND ZX80 THE DIODES ARE DIRECTLY ABOVE THE ORIGINAL KEYBOARD ON THE RIGHT SIDE. CONNECT TO THE UNBANDIED SIDE OF EACH DIODE (LEFT SIDE) AS SHOWN.

ZX81 KEYBOARD CONNECTOR PARTS LAYOUT.



CONNECT
HERE



SOME OF THE COMPUTERS HAVE, WHAT MAY BE A MINOR FACTORY DEFECT. THE SYMPTOM IS THAT SOME OF THE SHIFTED FUNCTIONS MAY NOT WORK RELIABLY (OR AT ALL). SOMETIMES THE SYMPTOMS MAY NOT APPEAR UNTIL YOU ADD OUR KEYBOARD, THE 16K RAM, PRINTER, OR ALL OF THEM. TO CORRECT THIS IN THE ZX81 REMOVE RESISTOR PACK RP3 AND REPLACE WITH INDIVIDUAL RESISTORS WITH A VALUE OF 4K TO 7K AS SHOWN BELOW. IN THE ZX80 AND MICROACE REPLACE THE RESISTORS LISTED IN TABLE 1 ABOVE WITH A VALUE OF 4K TO 7K.



CONNECT INDIVIDUAL
RESISTORS TOGETHER TO
REPLACE RP3 IN ZX81

IF YOU HAVE ANY PROBLEMS, WITH OUR KEYBOARD OR THE COMPUTER WE WILL MAKE EVERY EFFORT TO TRY AND SOLVE THEM FOR YOU. PLEASE WRITE WITH A DESCRIPTION OF THE PROBLEM AND/OR SYMPTOMS AND ENCLOSE A STAMPED, SELF-ADDRESSED ENVELOPE. IF YOU HAVE ANY COMMENTS ABOUT OUR PRODUCT, GOOD OR BAD, WE WANT TO HEAR THEM.

**DOUBLE H
ELECTRONICS**

195 Lelani
San Antonio
Texas
78242

KEYBOARD
CONVERSION

DATE 25 DEC 81

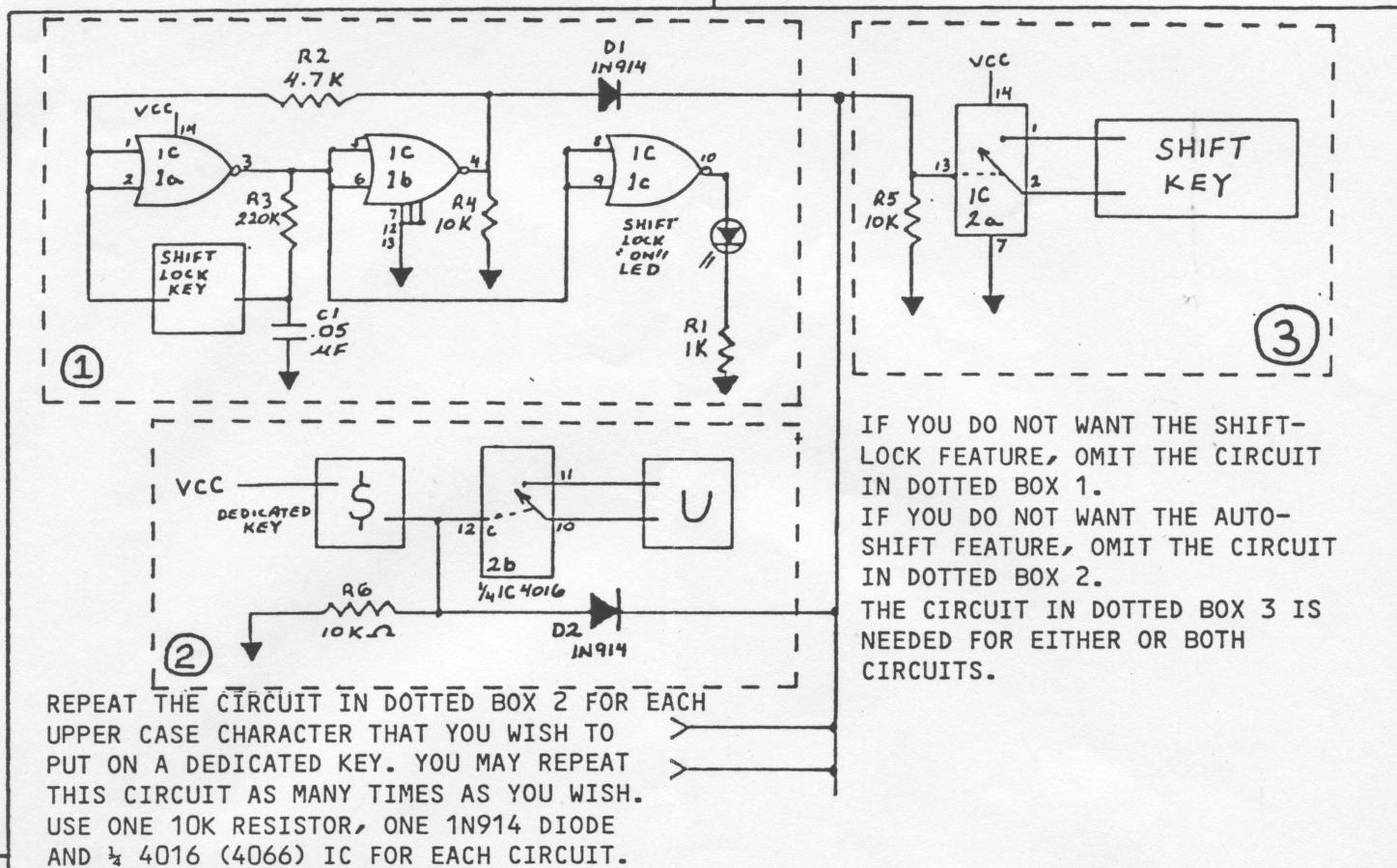
Harb Hanning

SHEET
1

REV
C

©1981 DHE

A



IF YOU DO NOT WANT THE SHIFT-LOCK FEATURE, OMIT THE CIRCUIT IN DOTTED BOX 1.
IF YOU DO NOT WANT THE AUTO-SHIFT FEATURE, OMIT THE CIRCUIT IN DOTTED BOX 2.
THE CIRCUIT IN DOTTED BOX 3 IS NEEDED FOR EITHER OR BOTH CIRCUITS.

THE AUTO-SHIFT CIRCUIT WILL AUTOMATICLY "PRESS" THE SHIFT KEY AND THE LOWER CASE KEY WHEN THE DEDICATED KEY IS PRESSED. THE EXAMPLE SHOWN IS "\$". YOU MAY CHOOSE ANY SHIFTED FUNCTION AND CONNECT IT IN A SIMILAR MANNER. CONNECT ONE TERMINAL OF ANY SPARE KEY TO VCC. CONNECT THE OTHER TERMINAL TO THE CONTROL INPUT OF THE IC. CONNECT THE OUTPUT CONTACTS OF THE IC TO THE KEY WHICH IS FOR THAT SHIFTED FUNCTION. HERE ARE SOME EXAMPLES:

FOR DELETE (RUBOUT) CONNECT TO 0 (ZERO)
FOR COMMA CONNECT TO THE PERIOD

FOR + CONNECT TO THE "K"
FOR = CONNECT TO THE "L"

PRESS THE SHIFT LOCK KEY ONCE AND THE LED WILL LIGHT AND THE KEYBOARD WILL BE LOCKED IN THE SHIFT MODE. PRESS THE SHIFT LOCK KEY A SECOND TIME AND THE KEYBOARD WILL RETURN TO NORMAL. NOTE: WHEN THE COMPUTER IS FIRST TURNED ON, THE SHIFT LOCK CIRCUIT MAY BE ACTIVATED. JUST PRESS THE SHIFT LOCK KEY ONCE TO TURN IT OFF.

BE SURE TO CONNECT PIN 7 OF EACH IC TO GROUND. BE SURE TO CONNECT PIN 14 OF EACH IC TO VCC (5 TO 12 VOLTS). PINS 12&13 OF IC 1 MUST BE CONNECTED TO GROUND. MOUNT THE LED IN ANY CONVENIENT PLACE ON THE KEYBOARD OR CASE.

R1	1K	D1	1N914
R2	4.7K	D2	1N914
R3	220K	IC1	4001
R4	10K	IC2	4016 OR 4066
R5	10K		
R6	10K		
C1	.05uF		

ALL RESISTOR VALUES ARE NOMINAL AND IN SOME CASES, OTHER VALUES MAY BE SUBSTITUTED AND THE CIRCUITS WILL STILL FUNCTION PROPERLY.

DOUBLE H
ELECTRONICS

SHIFT LOCK &
AUTO SHIFT
CIRCUITS

DATE 18 DEC 81

Herb Hornung

SHEET

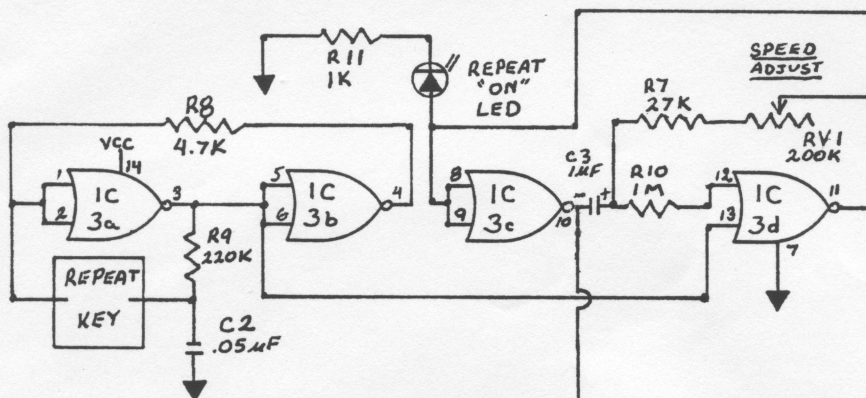
2

REV

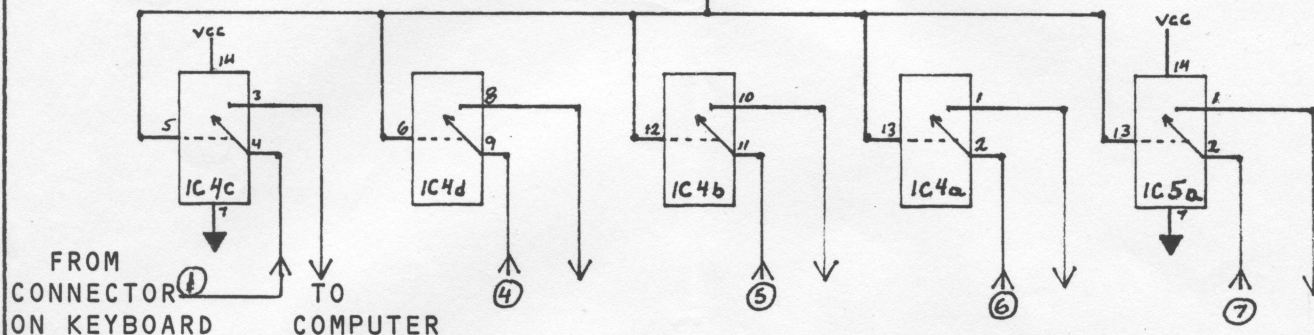
C

A

©1981 DHE



RV1	200K VAR
R7	27K
R8	4.7K
R9	220K
R10	1M
C2	.05μF
C3	1.0μF
IC4	4016, OR 4066
IC3	4001
IC5	4016, OR 4066
R11	1KΩ



USE ANY CONVENIENT SPARE KEY AS THE REPEAT KEY
 BE SURE TO CONNECT PIN 7 OF THE IC CHIPS TO GROUND
 BE SURE TO CONNECT PIN 14 OF THE IC CHIPS TO VCC
 CIRCLED NUMBERS REFER TO THE PINS ON THE KEYBOARD CONNECTOR
 CUT THE RIBBON CABLE FROM THE KEYBOARD TO THE COMPUTER AND
 CONNECT THIS CIRCUIT IN BETWEEN.

PRESSING THE "REPEAT" KEY ONCE WILL TURN ON THE LED WHICH WILL
 FLASH AT THE REPEAT RATE, AND PRESSING "REPEAT" AGAIN WILL TURN
 THE CIRCUIT OFF.

WHEN THE COMPUTER IS FIRST TURNED ON, THE REPEAT CIRCUIT MAY BE
 ACTIVATED, JUST PRESS THE REPEAT KEY ONCE TO TURN IT OFF.

ONCE THE REPEAT CIRCUIT IS ACTIVATED, ANY KEY WILL REPEAT AS LONG
 AS IT IS HELD DOWN.

IN OUR PARTS KIT WE PROVIDE ALL ELECTRONIC PARTS REQUIRED FOR ALL THREE CIRCUITS
 INCLUDING ENOUGH PARTS FOR 10 AUTO-SHIFT FUNCTIONS. ALL IC'S COME WITH SOCKETS.
 YOU PROVIDE ONLY SOLDER, WIRE, AND A SMALL PIECE OF PERF-BOARD FOR CONSTRUCTION.

PRICE IS ONLY \$15

ADD \$2 FOR U.S., OR APO SHIPPING

ADD \$3.50 FOR CANADA SHIPPING

ADD \$6 FOR OTHER FOREIGN SHIPPING

TEXAS RESIDENTS ADD 83¢ STATE SALES TAX

DOUBLE H
ELECTRONICS

AUTOMATIC
 REPEAT

DATE NOV 81

Hub Hornum

SHEET 3

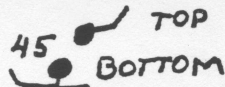
REV D

A

©1981 DHE

THE FOLLOWING INFORMATION IS PROVIDED FOR REFERENCE ONLY. THESE MODIFICATIONS
 HAVE ALREADY BEEN DONE ON YOUR KEYBOARD.
 EACH KEYSWITCH IS NUMBERED AND HAS AN UPPER AND LOWER CONTACT

EXAMPLE:



PERFORM THE FOLLOWING CUTS ON THE CIRCUITBOARD. CUT LEAD GOING IN ALL DIRECTIONS FROM THE CONTACT

43 BOTTOM
 42 BOTTOM
 28 BOTTOM
 29 BOTTOM
 14 BOTTOM
 1 BOTTOM
 39 BOTTOM
 26 BOTTOM
 12 BOTTOM
 13 BOTTOM
 41 BOTTOM
 15 BOTTOM
 25 BOTTOM

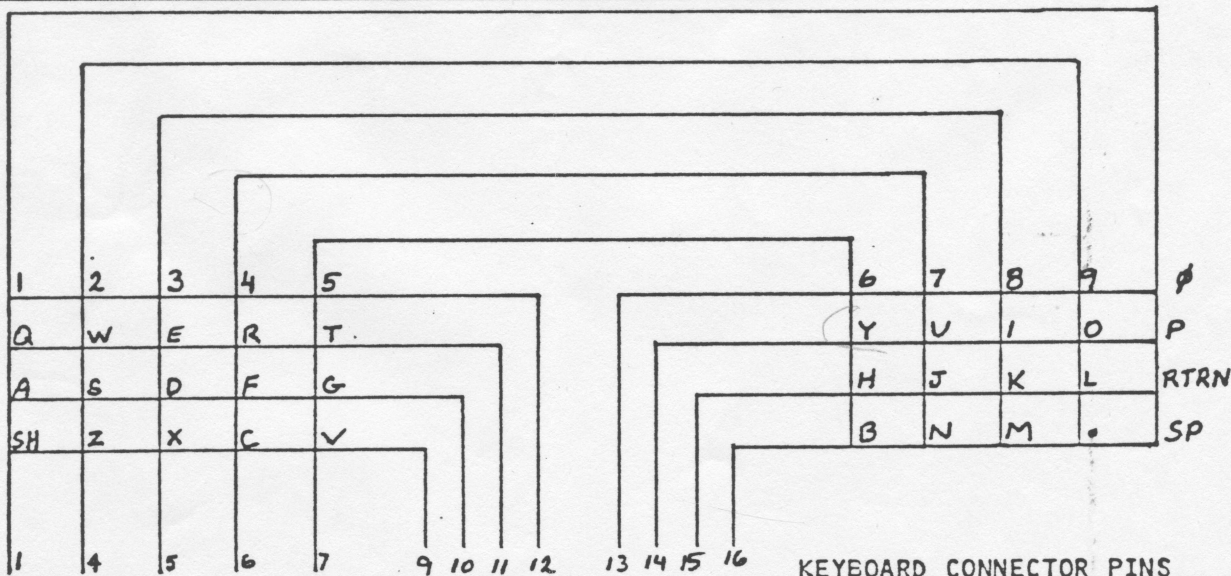
43 TOP
 42 TOP
 28 TOP
 29 TOP
 14 TOP
 1 TOP
 39 TOP
 26 TOP
 12 TOP
 13 TOP

PLEASE NOTE THAT
 DURING PRODUCTION,
 CUTS ARE MADE AT
 CONVENIENT PLACES
 ALONG THE CIRCUIT
 RUN, AND NOT
 NECESSARILY AT
 THE CONTACT PIN.

27 TOP

INSTALL JUMPERS

FROM	TO
41 TOP	30 TOP
41 BOTTOM	44 BOTTOM
53 TOP	40 BOTTOM
25 BOTTOM	24 BOTTOM
23 BOTTOM	UN-NUMBERED PIN BETWEEN 11&12
11 TOP	UN-NUMBERED PIN DIRECTLY ABOVE 26 BOTTOM
52 TOP	UN-NUMBERED PIN ABOVE 27



DOUBLE H
ELECTRONICS

KEYBOARD MOD
 FOR ZX
 COMPUTER

DATE NOV 81

Herb Homing

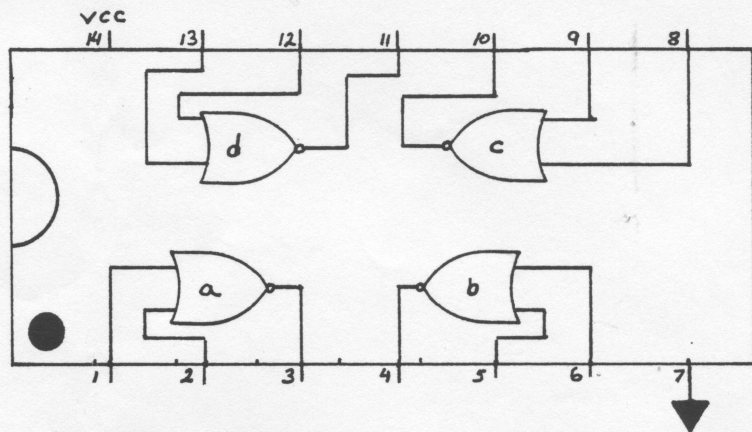
SHEET 4 REV B

©1981 DHE

A

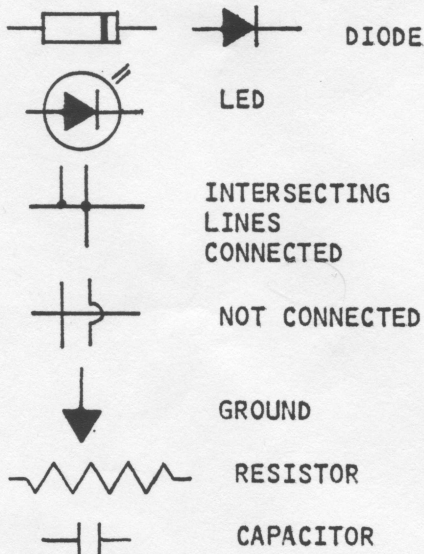
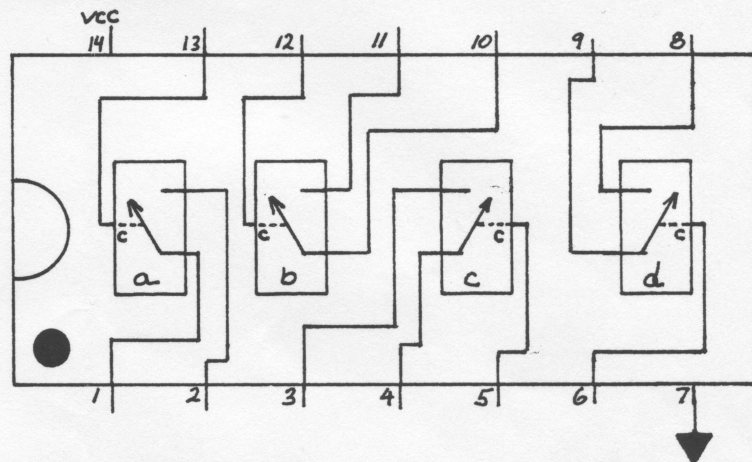
4001
QUAD NOR GATE

ALL UNUSED INPUTS MUST BE
CONNECTED TO GROUND



4016 (4066)
QUAD BILATERAL SWITCH

EACH SWITCH IS INDEPENDENT.
CONNECT A CONTROL (C) TO
VCC AND THE SWITCH CONTACTS
WILL CLOSE.



TO CHANGE THE LEGEND ON THE KEYTOPS:
PAINT OVER THE OLD LEGEND WITH "APPLIANCE TOUCH-UP"
WHITE PAINT OR ANY OTHER OPAQUE PAINT.
USE TRANSFER LETTERS OR FELT TIP PEN TO PUT ON THE
NEW LEGEND. FINISH WITH A FEW COATS OF CLEAR NAIL
POLISH OR PAINT. TOUCH ON THE NAIL POLISH, DO NOT
BRUSH ON, OR THE LETTERING MAY SMEAR.

BE VERY CAREFUL WHEN REMOVING AND REPLACING THE
KEYTOPS. PRY THEM OFF BY GENTLY PRYING WITH A
SMALL SCREWDRIVER OR KNIFE. BE SURE THAT THE
SWITCH CONTACTS DO NOT BEND OUT OF SHAPE WHEN
REPLACING THE KEYTOPS.

SINCE THE KEYTOPS TILT TOWARDS THE BACK OF THE
KEYBOARD, THE FRONT SIDE OF THE KEYTOPS MAY BE
USED FOR THE LEGEND. CLEAN THE FRONT OF THE
KEYTOP WITH NAIL POLISH REMOVER OR SOLVENT BEFORE
ADDING THE LEGEND.